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ABSTRACT

This teaching guide presents six lessons on using tables to solve problems. For each lesson, the guide gives the purpose, the rationales, materials, and detailed teaching procedures. The six lessons involve making a table, completing a table, using tables to solve problems (lessons 3 and 4), reading tables, and solving problems. Each lesson opens with a cartoon drawing that places the student in a school environment. This is followed by three or four problem situations and a page extending the experiences within the lesson. Optional activities are suggested. (MP)

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USING TABLES TO SOLVE PROBLEMS

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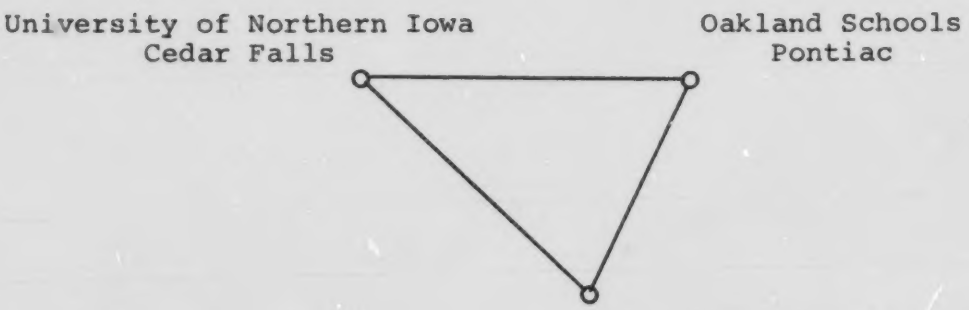

Mathematical

Problem

Solving

Project

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FOUR STEPS TO PROBLEM SOLVING

One of the principal goals of teaching mathematics is developing problem solving skills for children. It is a complex task and a real challenge for every teacher. It is easier to analyze this task if we identify four stages that most successful problem solvers go through. These stages are:

STAGE 1 Getting to know the problem

STAGE 2 Deciding what to do

STAGE 3 Doing it

STAGE 4 Looking back

We can better understand how to teach problem solving skills by analyzing the essential elements at each stage.

STAGE 1 GETTING TO KNOW THE PROBLEM

To solve a problem, the student not only must understand the words, but must also recognize the relation between the crucial elements. For example, a student may be able to read a problem about a spring, but unless he also recognizes that a spring stretches uniformly as weight are added, he will not be able to solve the problem.

The problem solver not only needs to identify the pertinent facts, but must also clearly identify the question that is being asked. Many students fail to get the correct answer because they answered the wrong question.

STAGE 2 DECIDING WHAT TO DO

The skills necessary at the "deciding what to do" stage are very different from those at the "get to know the problem" stage.

To be a successful problem solver, a student needs a variety of tools in addition to computation skills. These tools should include the ability to make good guesses, make tables, make diagrams, make graphs, write equations, and use other resources. The problem solver must choose from the tools he has available and make a plan to solve the problem. The modules in the Problem Solving Project are designed to teach the necessary tools and provide experiences in problem-solving situations.

STAGE 3 DO IT

This "do it" stage is closely related to Stage 2, "deciding what to do." A problem solver seldom chooses an attack that he doesn't know how to do. Therefore, this stage requires mastery of the tools discussed in Stage 2. The teaching of computational procedures alone is not enough to develop good problem solving skills. The invention of the hand calculator puts accurate computation within the grasp of all students, but it does not help them make the decisions that successfully solve problems.

STAGE 4 LOOK BACK

This stage is often ignored because once a student has an answer, it is on to the next problem. To get the most out of the effort, we first need to be sure the answer is correct. Then we need to take time to learn as much as possible from the experience of solving the problem. Just suggesting that the student "check the answer" and make sure the answer is "properly labeled" is not enough. Some teachers have increased the number of correct answers by using a "check" sheet that a student completes each time he solves a problem. The elements in this check sheet vary, but they include: Can you rephrase the problem with your answer? Does your answer fit your original estimate for the answer? Have you labeled your answer? This "check" sheet can be written on

board or made available in a duplicated form. It helps build good problem solving habits that increase the number of correct answers.

After the student has arrived at the correct answer, there is still a great deal to be learned by extending the solution. "Can you find an easier way to solve the problem?" or "How would you explain the solution to another student?" helps the student remember the processes the next time he needs to solve a similar problem. "Can you write another problem?" or "Can you think of a way to extend the problem to make it more interesting?" can encourage the student to look for more general methods of problem solving. When we encourage the student to reflect on the solution, the student is more likely to recall the solution the next time a problem like the one he solved occurs.

Each of the four stages requires a different kind of learning activity. "Getting to know" the problem and "looking back" involve learning that must take place over time. They can't be taught in one day. The teacher should focus on these stages each time a student faces a problem. The "deciding what to do" and the "do it" stages are developed by concentrating on specific skills. The problem solving modules in the Problem Solving Project are designed to create this focus.

USING TABLES TO SOLVE PROBLEMS

Using a table puts a focus on each step in the problem solving process. Keep the four steps in mind as you follow this example.

Three eggs sell for 15¢. What is the price of a dozen eggs?

Eggs			
Cost			

When a student makes the table he identifies the key information.

Eggs	3	6	
Cost	15		

When he begins to complete the table, he shows that he recognizes the relation.

Eggs	3	6	12	
Cost	15	30	60	

In a table the solution is easy to recognize and it is easy to see the student's reasoning.

When a student uses a table, he evidences an understanding of the problem before he proceeds to solve it. The table is often the simplest way to solve many problems and is usable by even the slower students.

There are four basic types of two-dimensional tables. Students need some experiences with each type.

Constant Sum

a	3	5	c	
b	4	2	6	

Relation

$a + b = 7$

Solution

$c = 7 - 6$

TE 4

Constant Difference

a	10	8	c	
b	6	4	2	

Relation: $a - b = 4$

Solution: $c = 2 + 4$ or $c = 7 - 4$

Constant Quotient or Ratio Table

a	6	12	c	
b	2	4	5	

Relation: $a \div b = 3$

Solution: $c = 5 \times \frac{6}{2}$ or $c = 5 \times 3$

Constant Product

a	6	12	c	
b	8	4	2	

Relation: $a \times b = 48$

Solution: $c = 48 \div 2$

The key to the development of skills using tables is the identification of the relation that exists in the table. This recognition comes from many experiences and goes beyond the memorization of a particular solution for a particular table. There are many solutions for each table. Recognizing these alternatives depend on the level of the learner.

Although all four types of tables occur in problem situations, by far the most common is the ratio table where there is a constant quotient. Therefore, most of the emphasis on two-dimensional tables should be on this type.

The use of tables in problem situations sometimes goes beyond the two-dimensional situation. For example, the table is a good approach for this problem.

What rectangle with an area of 36 square centimeters has the smallest perimeter?

Length				
Width				
Area				
Perimeter				

The table recognizes the key elements in the problem

Length	9			
Width	4			
Area	36			
Perimeter	26			

When the student puts in his first trial entries, he is well on his way to the solution.

Length	9	12	6	18
Width	4	3	6	2
Area	36	36	36	36
Perimeter	26	30	24	40

After a few entries, the student quickly identifies the 6 x 6 square as the solution.

Reading a table is also an important skill that needs to be taught. Information is often given in a table. What problems could you solve from the information in this table?

UNITED STATES MONEY

	Value	Weight (g)	Size (mm)	Thickness (mm)
Penny	.01	3.11	19	1.38
Dime	.10	2.27	17.9	1.18
Quarter	.25	5.67	24.3	1.45
Dollar Bill	1.00	1	157 x 66	.11

Could you use the table to answer these questions?

1. Would you rather have a ton of dimes or a ton of quarters?
2. How much does a million dollars weigh in dollar bills?
3. How long a line would a dollar's worth of pennies make?
4. How high could you stack a $100 in dimes?

Using a table, like many other problem solving skills, can't be completely taught in one lesson or even a series of lessons. However, it is not a skill that students will "stumble" on by accident. Once a student is introduced to a table as a problem solving method, you will be surprised how frequently it will be used.

TEACHING, USING TABLES TO SOLVE PROBLEMS

The ability to make, complete, and read tables is a powerful tool in solving problems. The table is one of the easiest and most meaningful ways to express a functional relationship. For example, students this age are interested in earning money. Knowing how much they can earn babysitting or mowing lawns per hour, they can make a table to predict how much money can be earned over long periods of time.

Tables are particularly helpful when a number of questions are presented that deal with the same relationship. If students are interested in purchasing candy with some of their earnings, a table can answer their questions about cost for various quantities

There are times when complex tables are available and used by individuals in society. Sales tax tables and wind chill charts are examples of these. The skill to read tables becomes an important technique in solving problems.

We have written this manual in six lessons:

Lesson 1: Making a Table
Lesson 2: Completing a Table
Lesson 3: Using Tables to Solve Problems
Lesson 4: Using Tables to Solve More Problems
Lesson 5: Reading Tables
Lesson 6: Solving Problems

The lessons are organized in the following way:

1. Each lesson opens with a cartoon drawing that places the student in a school environment.
2. This is followed by 3 or 4 problem situations.
3. The last student page of each lesson extends the experiences within the lesson.
4. Included in the teacher's manual are optional activities for the early finishers.

We recommend that you spend one classroom period on each lesson.

This module can be best presented by organizing your students in small groups of four. Small group organization encourages interaction and the sharing of ideas within teams.

Lesson 1 Making a Table

Purpose: Given a physical situation, the students will place entries in a table that describe the numerical relationship.

Rational: Although it appears that reading a table is a natural place to start developing table skills, the student doesn't recognize the relations in a table until he has made his own. Therefore, this lesson focuses on building tables out of physical experiences. Students learn by doing. Of course you would expect different levels of success.

Materials: Seven 4" x 6" index cards for each group of students.

Teaching Procedure:

Page 1: Discuss the opening scene.

Pages 2 and 3:

1. Read the cartoon strip and discuss the activity.
2. Have students work in groups putting entries in their tables.
3. Collect their entries in a table on the chalkboard.
4. Answer questions at the bottom of the page.

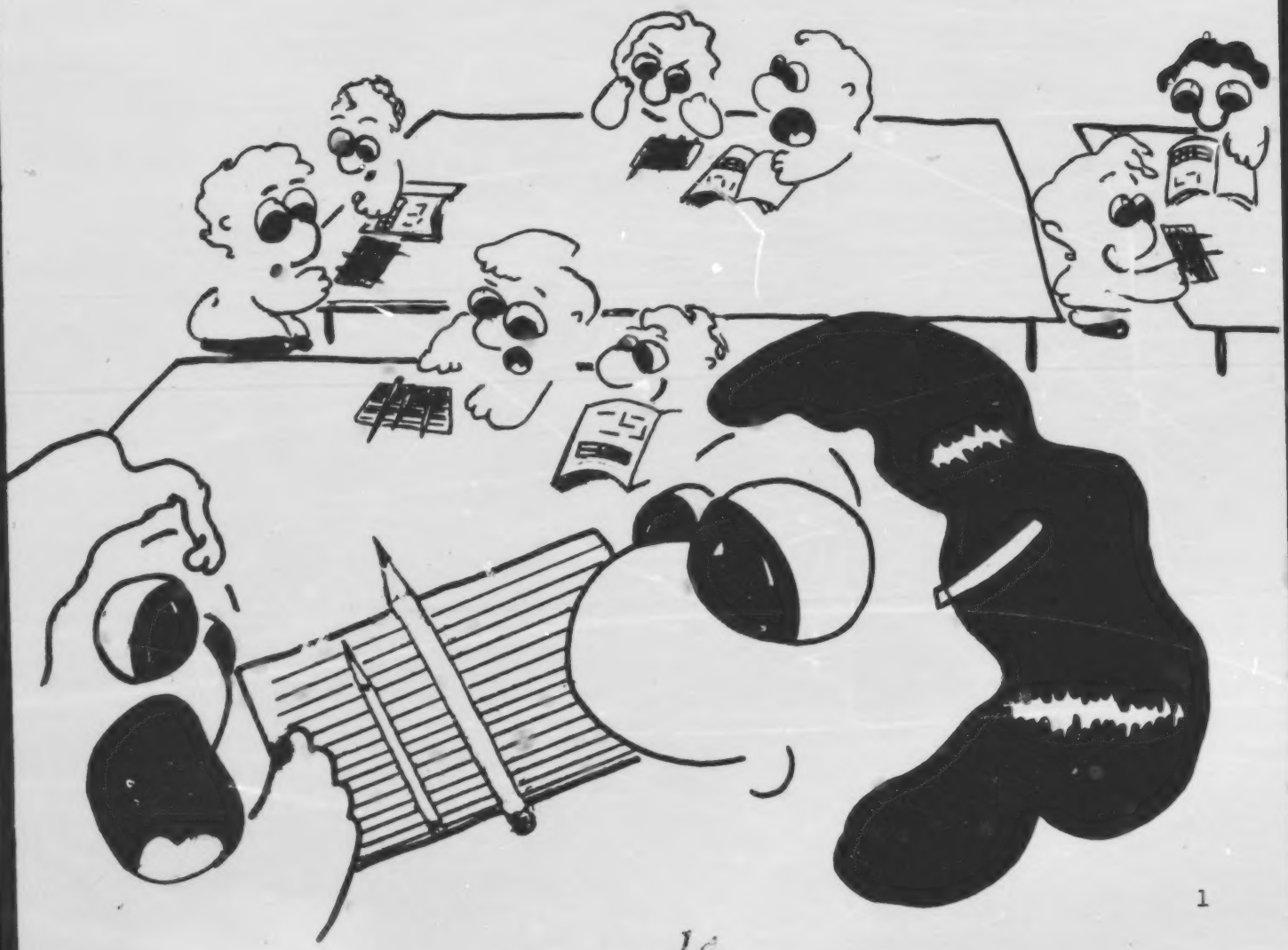
Pages 4, 5, and 6:

1. Small groups may work independently on these pages.
2. Observe the groups and listen to their discussion.

A and B:

1. Give an optional problem to early finishing groups.
2. Have groups make tables on separate pieces of paper.

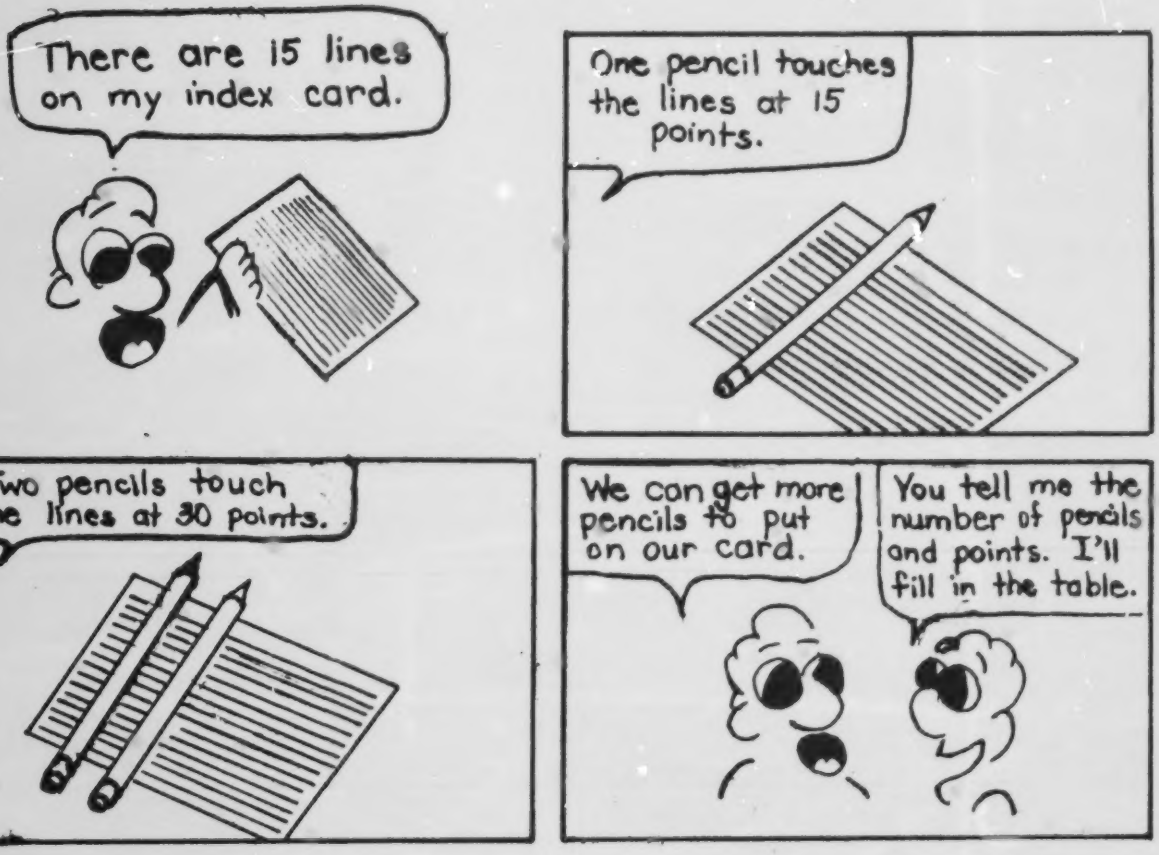
LESSON 1
MAKING A TABLE



In this lesson, students will be introduced to three types of tables. This table is a constant quotient (often called constant ratio) table. The quotient of each pair of entries is 15. We do not expect your students to verbalize this relationship. This page is designed to develop this idea at an experimental level without becoming too sophisticated.

Do not push for closure. Students learn at different rates and too much pressure for generalization often defeats the purpose of the experience.

Your comments:


There are 15 lines on my index card.
One pencil touches the lines at 15 points.
Two pencils touch the lines at 30 points.
We can get more pencils to put on our card.
You tell me the number of pencils and points. I'll fill in the table.

MAKE A TABLE

Pencils	1	2					
Points	15	30					

RING T IF THE SENTENCE IS TRUE. RING F IF THE SENTENCE IS FALSE.

T F 1. The headings in the table are pencils and points.

T F 2. Four pencils would touch 60 points.

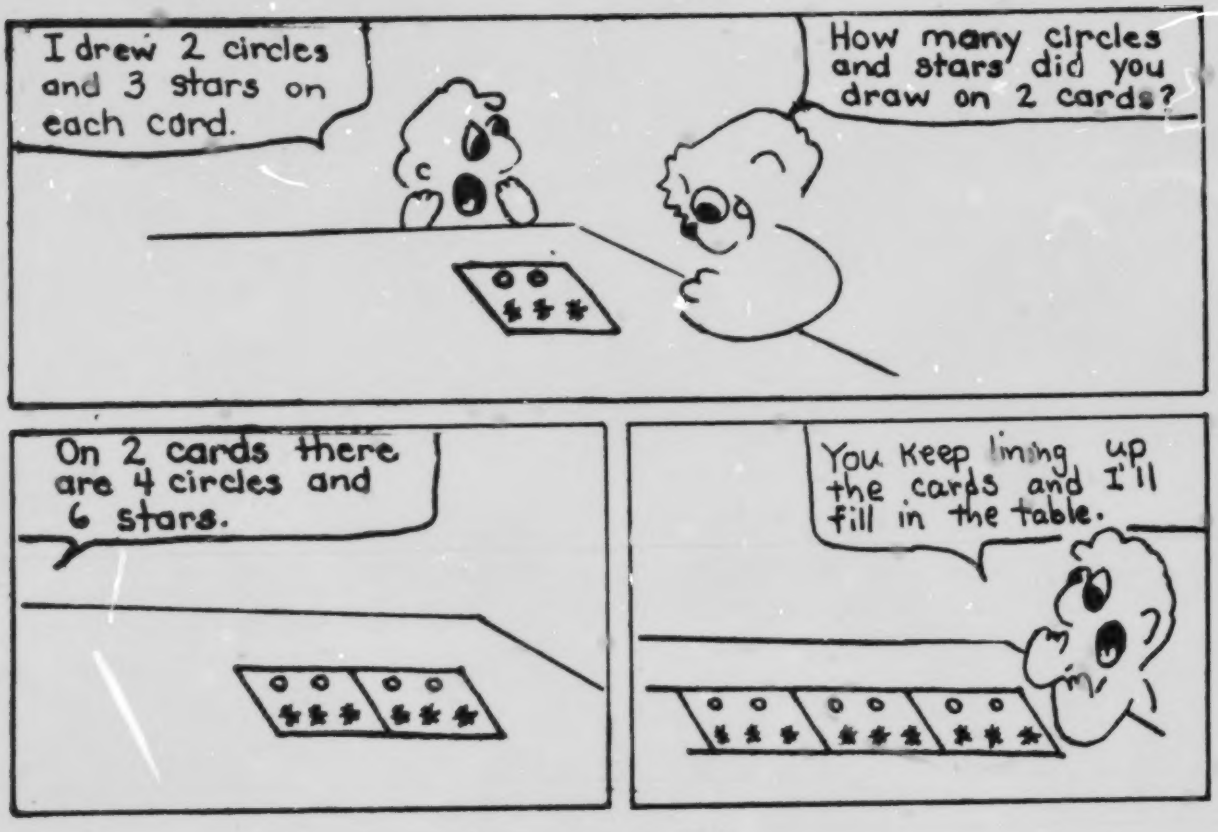
T F 3. Ten pencils would touch 150 points.

T F 4. To touch 105 points you need 6 pencils.

This table is a constant sum table. The sum of each pair of entries is 7. Some students may recognize this relationship.

Don't expect all students to see the relation. It is enough to learn to put the information in a table form.

Your comments:

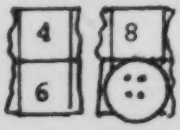

I drew 2 circles and 3 stars on each card.
How many circles and stars did you draw on 2 cards?
On 2 cards there are 4 circles and 6 stars.
You keep lining up the cards and I'll fill in the table.

MAKE A TABLE

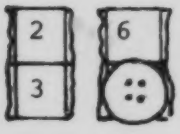
Circles	2	4					
Stars	3	6					

TRUE OR FALSE?

T F 1. Ten circles line up with 15 stars.

T F 2. 

Since 4 x 2 is 8, the number under the button is another name for 6 x 2.

T F 3. 

Since 2 x 3 is 6, the number under the button is another name for 3 x 3.

This table is a constant difference table. The difference between each pair of entries is 8. In discussing their responses to the second and third questions, students should recognize this relationship.

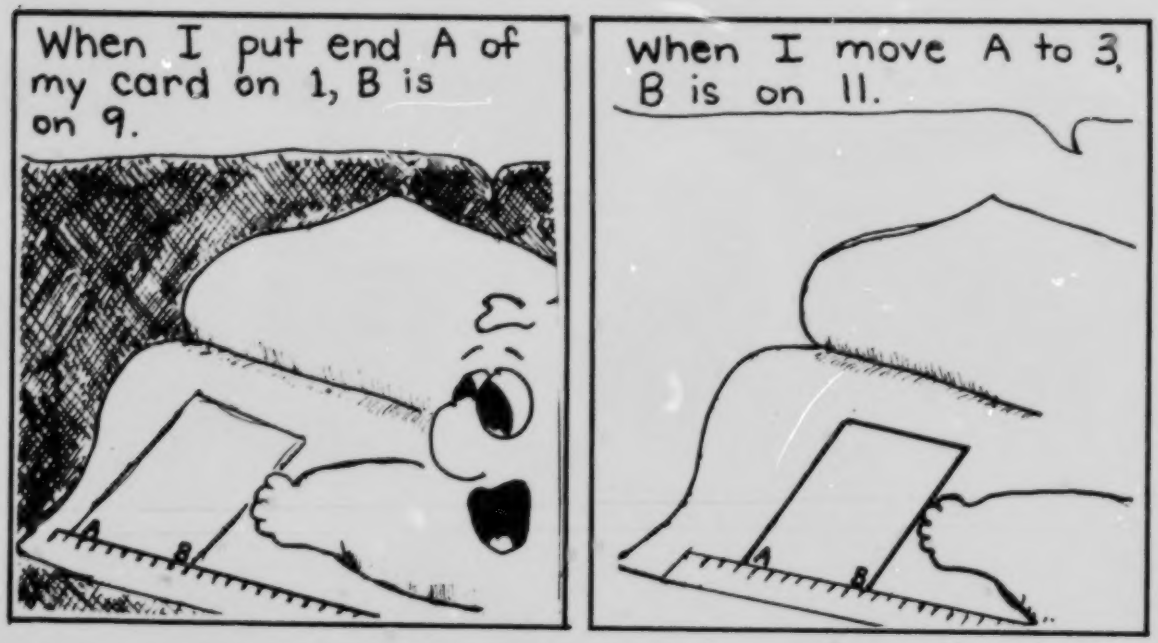
Your comments:

_____

_____

_____

_____



TAKE YOUR INDEX CARD. LABEL IT LIKE THE ONE IN THE PICTURE.
USE THE RULER AT THE SIDE OF THIS PAGE.
MAKE A TABLE.

A	1	2							
B	9	10							

TRUE OR FALSE?

T F 1. When A is on 5, B is on 10.

T F 2. The width of the card is 8 units.

T F 3. Every time you subtract A from B, you get 8.

T F 4. When B is on 19, A is on 11.

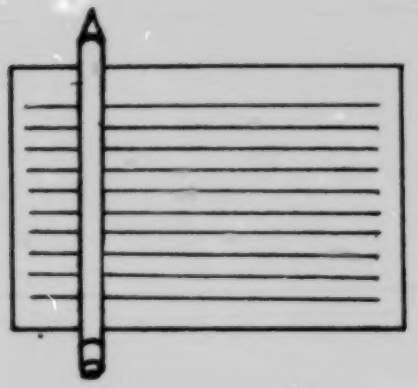
This table is another example of the constant quotient table.

Questions 2 and 3 provide students with a multiplication method for checking their entries. When one number in a pair of entries is multiplied by any number, the other number in the pair must be multiplied by the same number. Most students will develop some method for finding the missing entries. Don't expect all the students to use multiplication. Some will see a pattern and count, others will multiply both entries by the same number and still others will multiply the cross products if they have had experience with ratios.

Your comments:

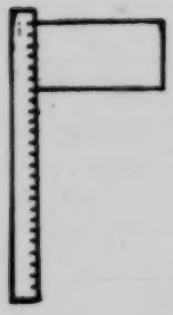
COMPLETE THE TABLES.

1. There are 10 lines on this card.



Pencils	1	3	4		10
Points	10			90	

2. This card is 6 units wide.



A	1	2	4		9
B	7			11	

3. There are 3 circles and 4 stars on each card.

Circles	3	6		12	15	
Stars	4		12			24

Lesson 1 A B

OPTIONAL ACTIVITIES

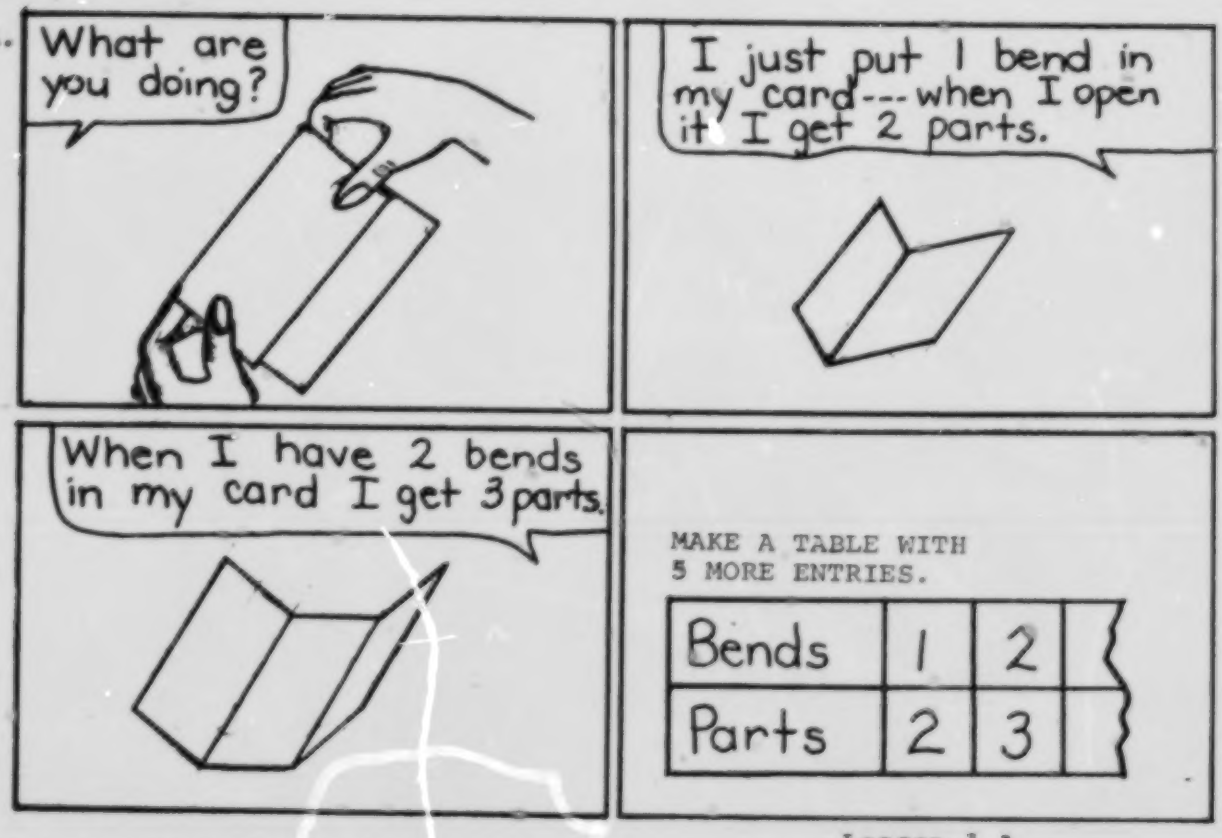
In our previous try-out experiences, we've found that lessons written for several age levels may be too long for some levels and too short for other levels.

We hope we have prepared these lessons so all students can complete them in one math period. Then we have provided optional activities for the early finishing groups.

The optional activities for this lesson are labeled Lesson 1 A and Lesson 1 B. There are two copies of each of these pages. On each page are several problems.

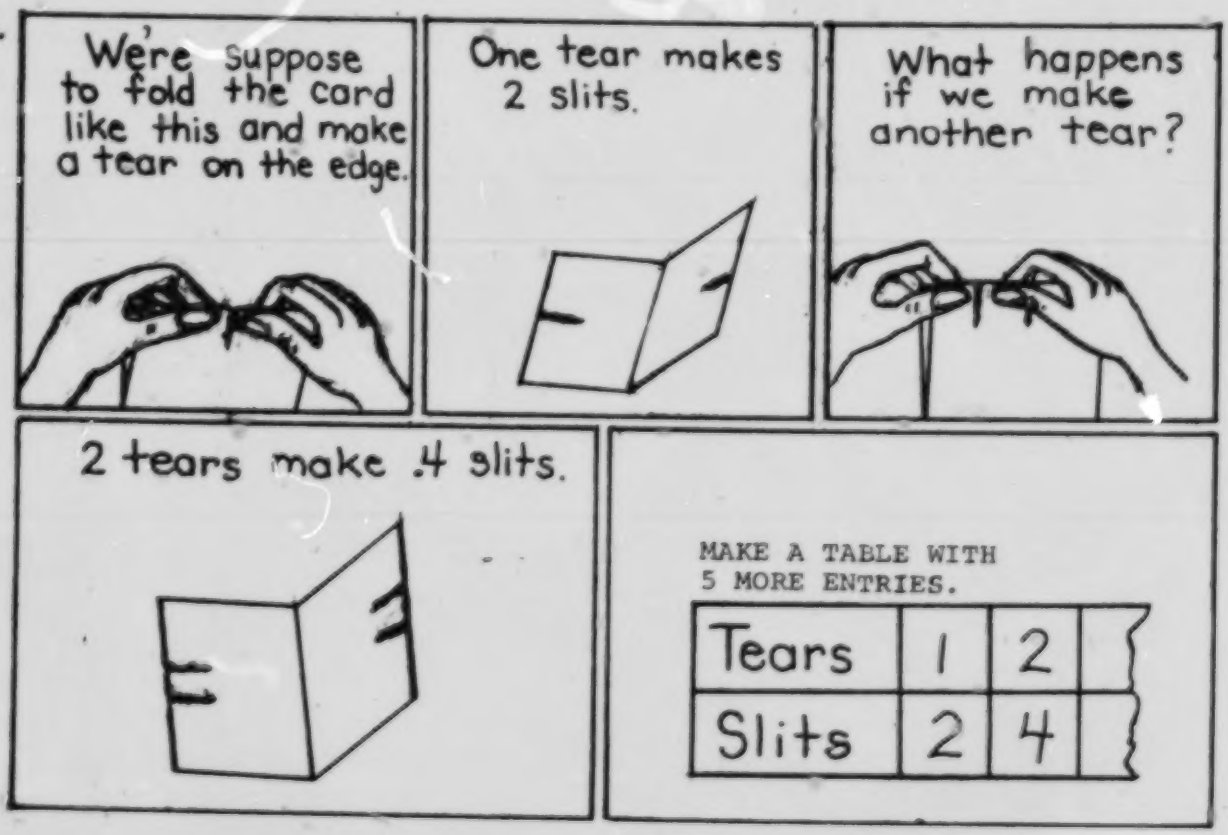
1. Cut the problems apart on the dotted lines.
2. Early finishers may get 1 problem at a time and solve it on a separate piece of paper.
3. The problems can be shared with other early finishing groups.

A.


What are you doing?
I just put 1 bend in my card --- when I open it I get 2 parts.
When I have 2 bends in my card I get 3 parts.
MAKE A TABLE WITH 5 MORE ENTRIES.
Bends | 1 | 2 |
Parts | 2 | 3 |

Lesson 1 A

B.


We're suppose to fold the card like this and make a tear on the edge.
One tear makes 2 slits.
What happens if we make another tear?
2 tears make 4 slits.
MAKE A TABLE WITH 5 MORE ENTRIES.
Tears | 1 | 2 |
Slits | 2 | 4 |

Lesson 1 A

C.

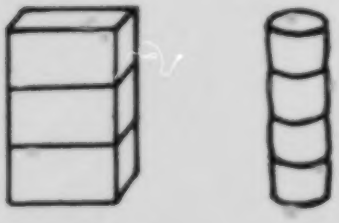
MAKE A TABLE WITH 5 MORE ENTRIES.

Mother's Age	29	33	
Daughter's Age	8	12	

Lesson 1 B

D.

3 boxes have the same height as 4 cans.



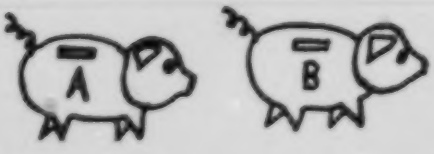
MAKE A TABLE WITH 5 MORE ENTRIES.

Boxes	3	6	
Cans	4	8	

Lesson 1 B

E.

I put 11 coins in the two banks.



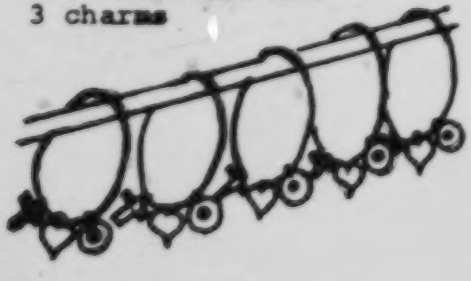
MAKE A TABLE WITH 5 MORE ENTRIES.

Bank A	11	2	
Bank B	0	9	

Lesson 1 B

F.

Each bracelet has 3 charms



MAKE A TABLE WITH 5 MORE ENTRIES.

Bracelets	1	2	
Charms	3	6	

Lesson 1 B

Lesson 2 Completing a Table

Purpose: Given some entries in tables, the students will determine the relationships and complete the tables.

Rational: This lesson uses a familiar playground setting to develop the addition and multiplication methods to solve missing entries in a ratio table. The first two parts focus on the addition method and the second two on multiplication. Some students who have had previous instruction may use "cross products" to find the missing entries.

Teaching Procedure:

Page 6: Discuss the opening scene.

Pages 7 and 8:

1. Read the cartoon strip and discuss the situation.
2. Have students work in groups to complete their tables.
3. Collect the missing entries in a table on the chalkboard.
4. Answer questions at the bottom of the page.

Pages 9 and 10:

1. Small groups may work independently on these pages.
2. Observe the groups and listen to their discussion.

A and B:

1. Give an optional problem to early finishing groups.
2. Have groups complete tables and solve problems on separate pieces of paper.

LESSON 2
COMPLETING A TABLE

There are many ways to find missing entries in ratio tables. The simplest and most obvious to the student is the counting or pattern method. It is the first that most students use.

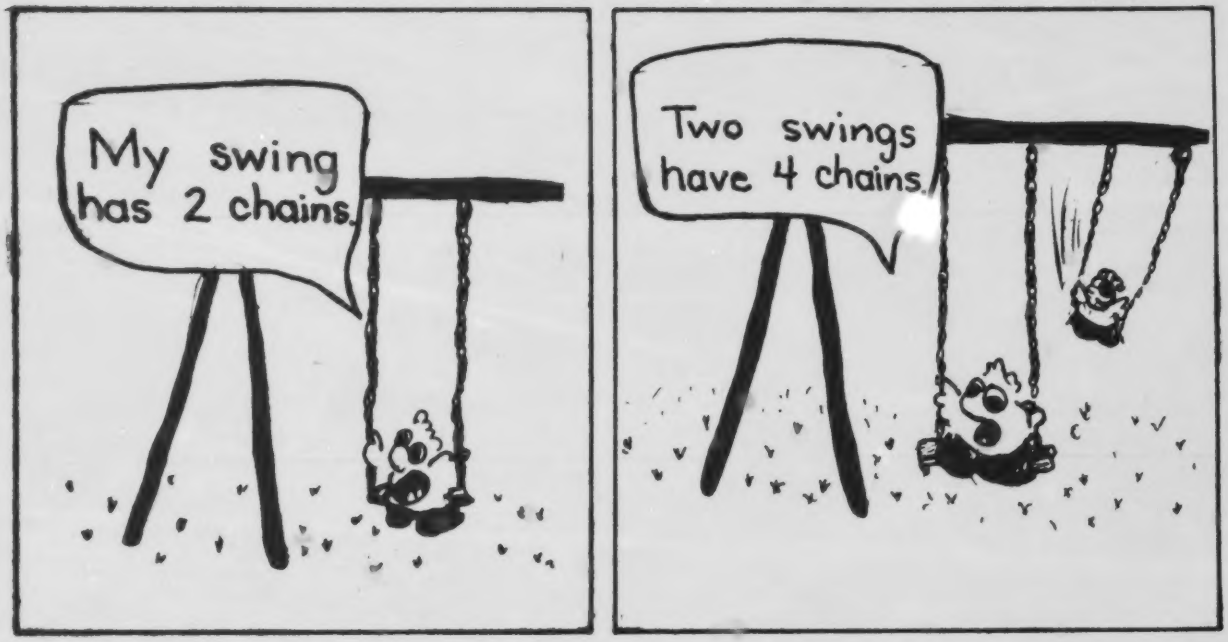
2	4	6	8
3	6	9	12

When the entries are arranged like this, the students quickly see 2, 4, 6, 8 as a pattern for the top numbers and 3, 6, 9, 12 for the bottom numbers and use this pattern to generate new entries.

The second method and the initial push of pages 7 and 8 is the addition method. Notice in the table above, that if you add a pair of top numbers like 2 + 4 you get a new top number. If you add the matching bottom numbers, 3 + 6, you get the matching bottom number.

The questions at the bottom of pages 7 and 8 push the addition method for checking answers in the ratio table. Some students may realize that this addition idea can also be used to generate new pairs of entries.

Your comments:

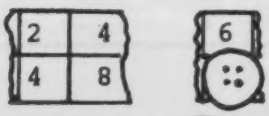


COMPLETE THE TABLE.

Swings	1	2	4		12		28
Chains	2	4		12		32	

RING T IF THE SENTENCE IS TRUE. RING F IF THE SENTENCE IS FALSE.

T F 1. There are 12 chains for 6 swings.

T F **2.** 

The number under the button is another name for 4 + 8.

T F 3.

The number under the button is another name for 4 + 12.

T F 4.

The number under the button is 48.

In getting to know this problem, you might have pairs of students model a 3-legged race.

Your comments:

_____

_____

_____

_____

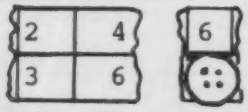
We are partners in the 3 legged race!
Two of our legs are in the bag so it looks like we have 3 legs for the two of us.
When 4 of us run in the race we have 6 legs.

COMPLETE THE TABLE.

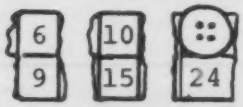
People	2	4	6	10		16	
Legs	3	6			18		30

TRUE OR FALSE?

T F 1. If there were 16 people in the 3-legged race, it would look like there were 32 legs.

T F 2. 

The number under the button is another name for 3 + 6.

T F 3. 

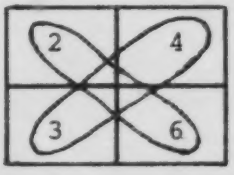
The number under the button is 12.

T F 4. When two numbers in the same row are added, you get another number that could be in that row.

The multiplication method of checking entries is developed on page 9. Students should observe that you can get new entries or verify entries by multiplying both numbers by the same number. For example:

2 x 2	4
3 x 2	6

Some students may also observe that they can check entries by comparing the cross products of the entries. For example:



2 x 6 = 13

and

3 x 4 = 12

This is true for all ratio tables. This is the most general method, but also the most difficult to develop. Remember that the objective of these lessons at this time is not to completely develop the use of tables, but only to provide experience with the basic use of tables in problem solving. Don't push for all methods.

Your comments:

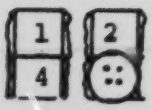
Time me and see how long it takes me to make 1 swing.
OK, I timed it. One swing every 4 seconds.
I've made 5 swings--- Have I been swinging for 20 seconds?
Right!

COMPLETE THE TABLE.

Swings	1	2	3	6		18	24	
Seconds	4	8			48			120

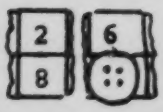
TRUE OR FALSE?

T F 1. Two swings would take twice as long as 1 swing.

T F 2. 

The number under the button is another name for 4 x 2.

T F 3. Six swings would take three times as long as 2 swings.

T F 4. 

2 x 3 = 6

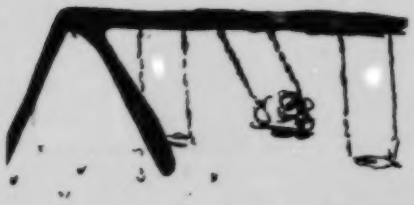
Another name for the number under the button is 8 x 3.

Lesson 2

Page 10

The experiences on this page are similar to the activities in the lesson, however students will use their entries to solve the problems.

Your comments:



COMPLETE THE TABLE.

Swings	1		5		
Chains	2	8		12	20

1. There are _____ chains for each swing.

2. Twelve chains would make _____ swings.

3. For 35 swings there would be _____ chains.

COMPLETE THE TABLE.

People	2	6	14		60
Legs	3			24	

4. When 6 people race it looks like they have _____ legs.

5. When it looks like there are 24 legs, there are _____ people racing.

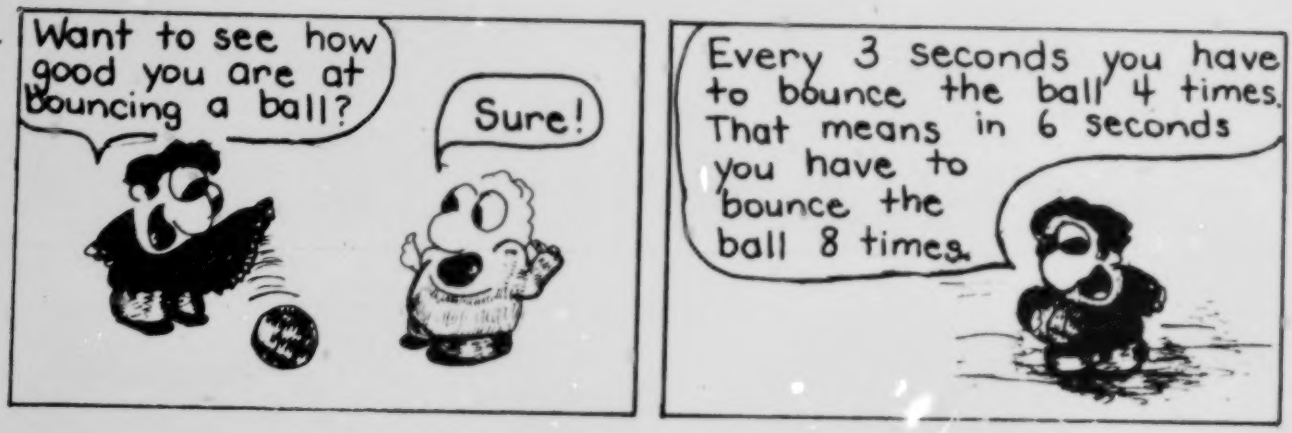
6. When it looks like there are 90 legs, there are _____ people racing.

OPTIONAL ACTIVITIES

There are two copies of the optional activities for this lesson.

These extending experiences may be given to the early finishing groups. Once again the students may need to be reminded to write their solutions on separate pieces of paper so other groups can use this same problem.

A.


Want to see how good you are at bouncing a ball?
Sure!
Every 3 seconds you have to bounce the ball 4 times. That means in 6 seconds you have to bounce the ball 8 times.

COMPLETE THE TABLE ON YOUR OWN PAPER.

Seconds	3	6	9	15		120
Bounces	4	8			80	

Lesson 2 A

B.

COMPLETE THE TABLE ON YOUR OWN PAPER.

Me	5	10	20		60	
You	3	6		30		60

C.

The front tire makes 6 turns for every 5 turns of the rear tire.

COMPLETE THE TABLE ON YOUR OWN PAPER.

Front Tire	6	12		60	600	
Rear Tire	5		20			1000

Lesson 2 B

D.

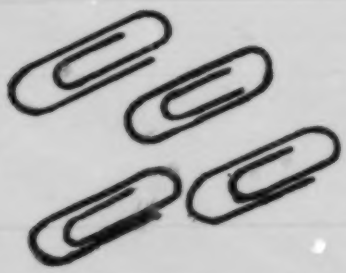
Three candy bars cost 40¢.

COMPLETE THE TABLE ON YOUR OWN PAPER.

Candy Bars	3	9	15		45	
Cents	40			400		1000

Lesson 2 B

E.



4 paper clips weigh 5 grams.

COMPLETE THE TABLE ON YOUR OWN PAPER.

Paper Clips	4	20	100		400	
Grams	5			250		1000

Lesson 2 B

Lesson 3 Using Tables to Solve Problems

Purpose: Given problem situations, the student will make tables to solve a series of related problems.

Rational: At this point the student makes a table for the situation and then answers a series of problems related to the table. To answer the questions, the student must use one of the methods developed to find new entries.

Teaching Procedure:

Page 11: Discuss the opening scene.

Pages 12 and 13:

1. Read the cartoon strip and discuss the situation.
2. Have students work in groups putting entries in their tables.
3. Collect their entries in a table on the chalkboard.
4. Have the groups solve the problems at the bottom of the page. (Additional entries may be needed.)
5. Discuss ways that different entries can be used to solve the problems.

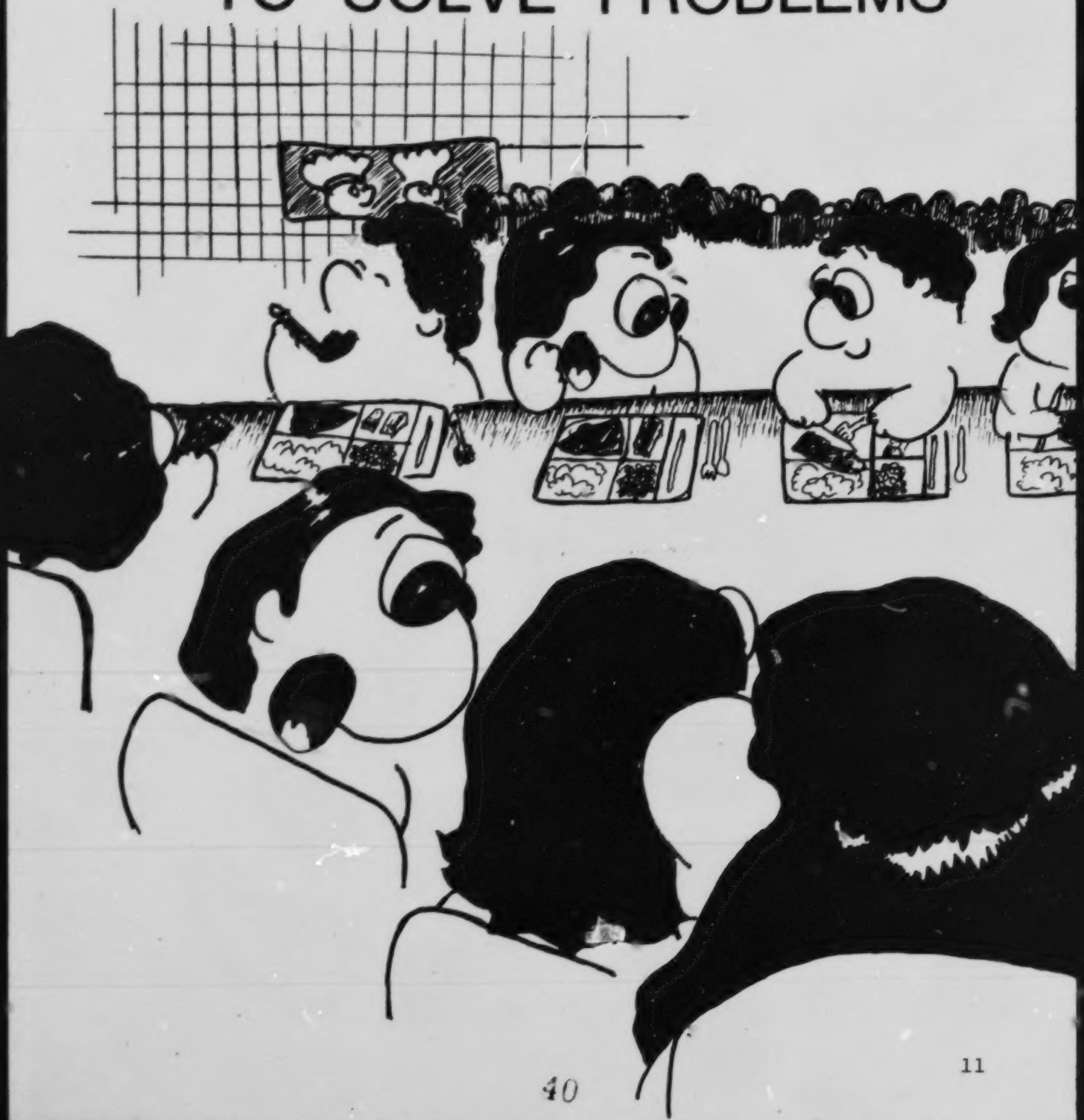
Pages 14 and 15:

1. Small groups may work independently on these pages.
2. Observe the groups and listen to their discussion of answers.

A, B, and C:

1. Give an optional problem to early finishing groups.
2. Have groups make tables and solve problems on separate pieces of paper.

LESSON 3
USING TABLES TO SOLVE PROBLEMS



A short sharing session may be held to discuss answers to these problems. It would be interesting to have the students explain different ways that their table entries could be used to solve the problems. You can expect some students to follow the pattern to find new entries. Others will add to find entries and others will multiply. The sharing process will help all students improve their methods.

Your comments:

FILL IN THIS TABLE.

Meals	1						
Cost	40¢						

SOLVE THESE PROBLEMS.

1. How much would 2 hot lunch meals cost? _____

2. How much would 4 meals cost? _____

3. How many meals could you buy for $4.00? _____

4. You have $3.00. Do you have enough money to buy 7 meals?
_____

5. How much would it cost to eat 15 meals in the cafeteria?
_____

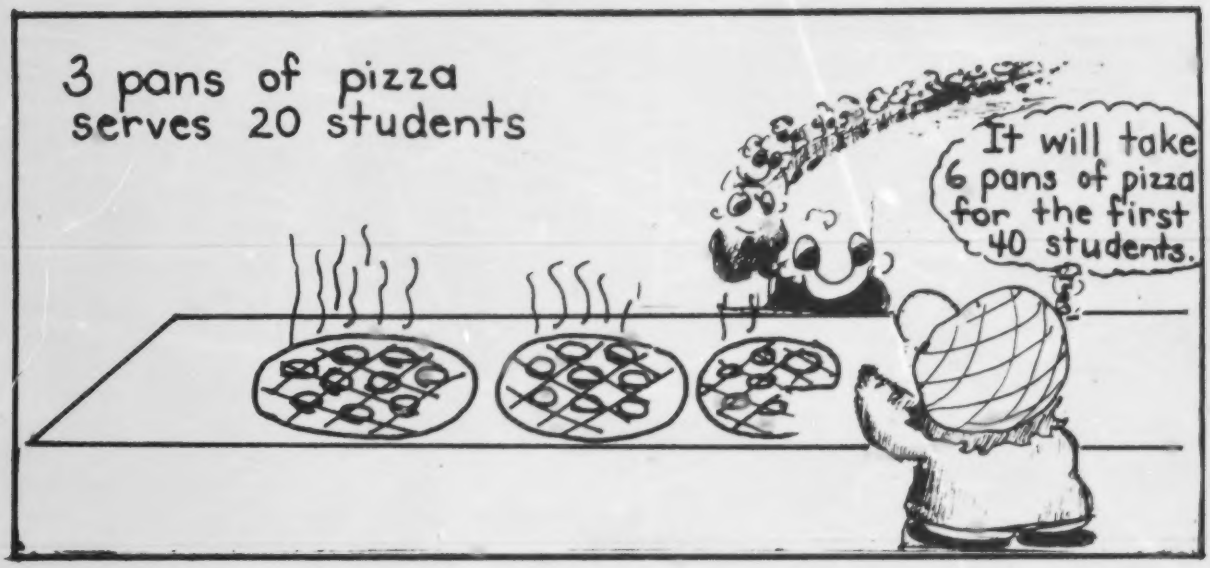
Your comments:

_____

_____

_____

_____



FILL IN THIS TABLE.

Pans of Pizza	3						
Students	20						

SOLVE THESE PROBLEMS.

1. How many students can be served from 12 pans of pizza? _____

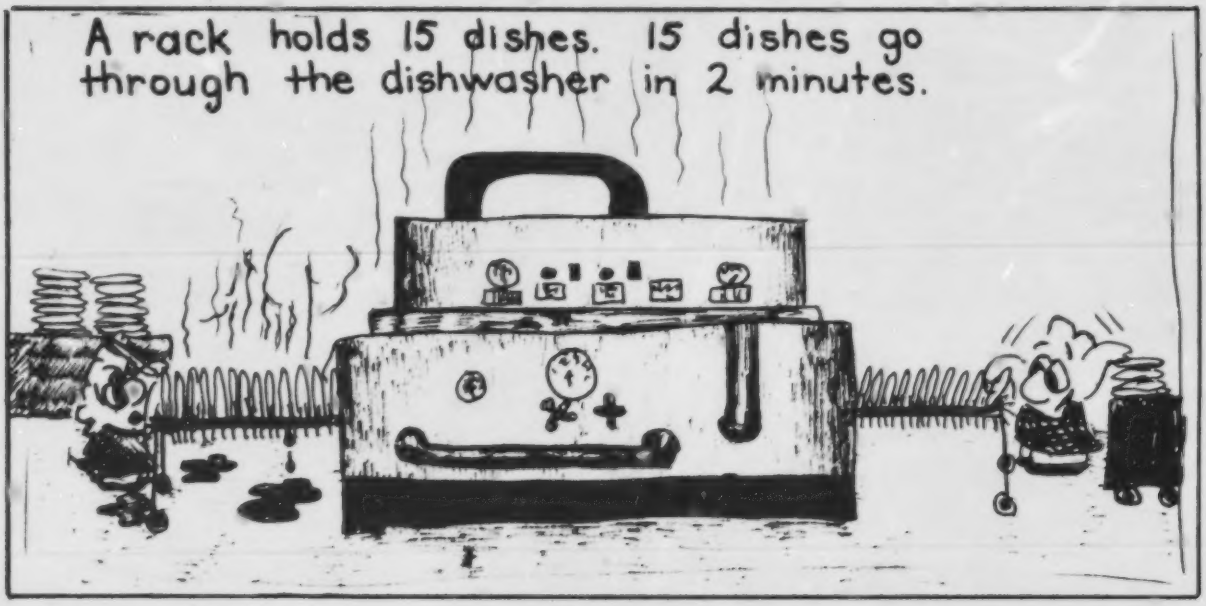
2. How many pans of pizza for 100 students? _____

3. Last week 80 pans of pizza were served. How many students ate pizza last week? _____

4. Would 45 pans of pizza serve 400 students? _____

In the students' discussion of their solutions to the problems, you may want to make individual contacts with groups and ask them to explain how their table was helpful. It might be especially insightful to hear them discuss problem 3.

Your comments:



FILL IN THIS TABLE.

Dishes	15						
Minutes	2						

SOLVE THESE PROBLEMS.

1. How many minutes would it take to wash 30 dishes? _____

2. How many dishes can go through the dishwasher in 10 minutes? _____

3. How many minutes to wash 165 dishes? _____

4. How many dishes can go through the dishwasher in 30 minutes? _____

It might be interesting to note how many students refer to the original problem in this lesson as they decide whether their solution makes sense.

Your comments:

FILL IN THE TABLES. SOLVE THE PROBLEMS.

Meals	1					
Cost	40¢					

1. How much would it cost to buy 30 meals? _____

2. The cafeteria collected $100. How many meals were sold? _____

Dishes	15					
Minutes	2					

3. How many minutes to wash 300 dishes? _____

4. How many dishes can go through the dishwasher in 20 minutes? _____

Pans of Pizza	3					
Students	20					

5. The cook baked 39 pans of pizza. How many students does she expect to serve? _____

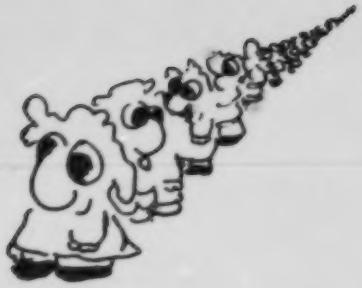
6. There were 220 students who ate pizza. How many pans of pizza were served? _____

Lesson 3 A B C

OPTIONAL ACTIVITIES

These optional activities are for early finishing groups.

A.



The cooks in the cafeteria expect to serve 20 students every 3 minutes.

MAKE A TABLE ON YOUR OWN PAPER

Students	20				
Minutes	3				

1. How many students can be served in 6 minutes?

2. Is 12 minutes enough time to serve 100 students?

Lesson 3 A

B.

The cooks in the cafeteria bake 3 brownies for every 2 students.

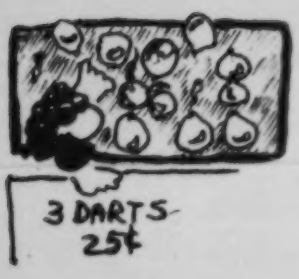
MAKE A TABLE ON YOUR OWN PAPER

Brownies	3				
Students	2				

1. How many brownies were baked for 80 students?

2. When the cook bakes 240 brownies, how many students are expected to eat?

C.



At the carnival, you can throw 3 darts for 25¢.

Darts	3		
Cost	25¢		

1. How much would it cost to toss 6 darts?

2. How many darts could you throw for $1?

3. How much would it cost to toss 30 darts?

Lesson 3 B

5 dimes have the same value as 2 quarters.

D.

Dimes	5		
Quarters	2		

1. A stack of 10 dimes is worth how many quarters?

2. A stack of 40 dimes is worth how many quarters?

3. How many dimes have the same value as 40 quarters?

E.

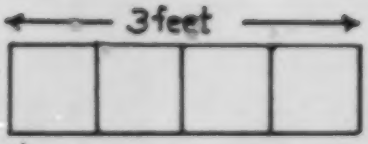
Two bottles will fill 3 glasses.

Bottles	2		
Glasses	3		

1. How many bottles to fill 6 glasses?
2. How many bottles to fill 60 glasses?
3. Will 24 bottles fill 40 glasses?

Lesson 3 C

F.



The length of 4 tiles is 3 feet.

Tiles	4		
Feet	3		

1. How long is a line of 8 tiles?
2. How long is a line of 40 tiles?
3. How many tiles would make a line 60 feet long?

Lesson 4 Using Tables to Solve More Problems

Purpose: Given mathematical problems, the students will build tables and determine entries to solve the problems.

Rational: In this lesson the student "puts it all together." He needs to make his own table, fill in some entries to establish the relation, and then use the table to solve a problem. Not all students will approach the situation with the same skills, but they all should be able to find the answers using a table.

Teaching Procedure:

Page 16: Opening scene.

Pages 17 and 18:

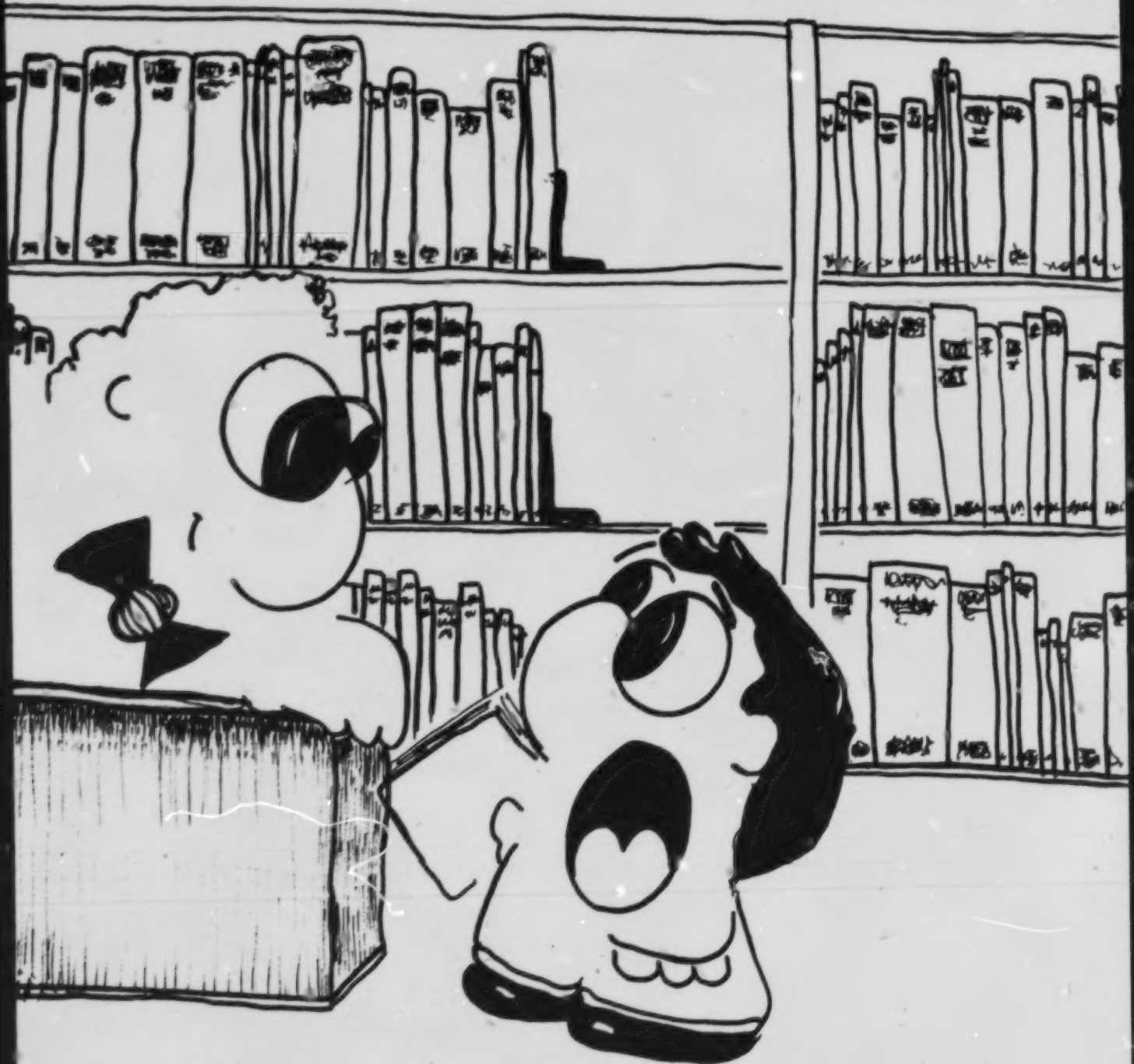
1. Read the cartoon strip.
2. Have groups put 3 or 4 entries in their tables.
3. Collect their entries in a table on the chalkboard.
4. Have the groups solve the problems at the bottom of the page. (Additional entries may be needed.)
5. Discuss ways that different entries can be used to solve the problems.

Pages 19 and 20:

1. Groups finish lesson independently.
2. Have them compare answers and explain their thinking in groups.

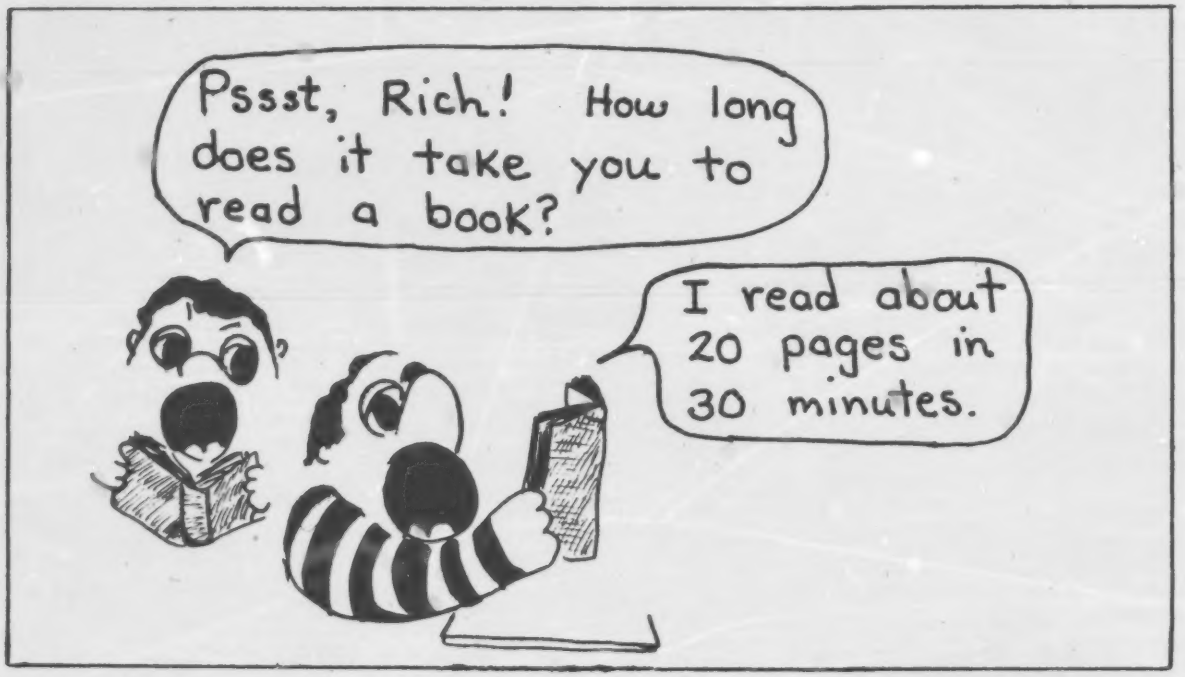
A and B: Optional sheets for early finishers.

LESSON 4
USING TABLES TO SOLVE MORE PROBLEMS



In discussing the anssers tc their problems, encourage students to explain how they used the entries in their tables to solve the problems.

Your comments:



FILL IN THIS TABLE.

Pages								
Time								

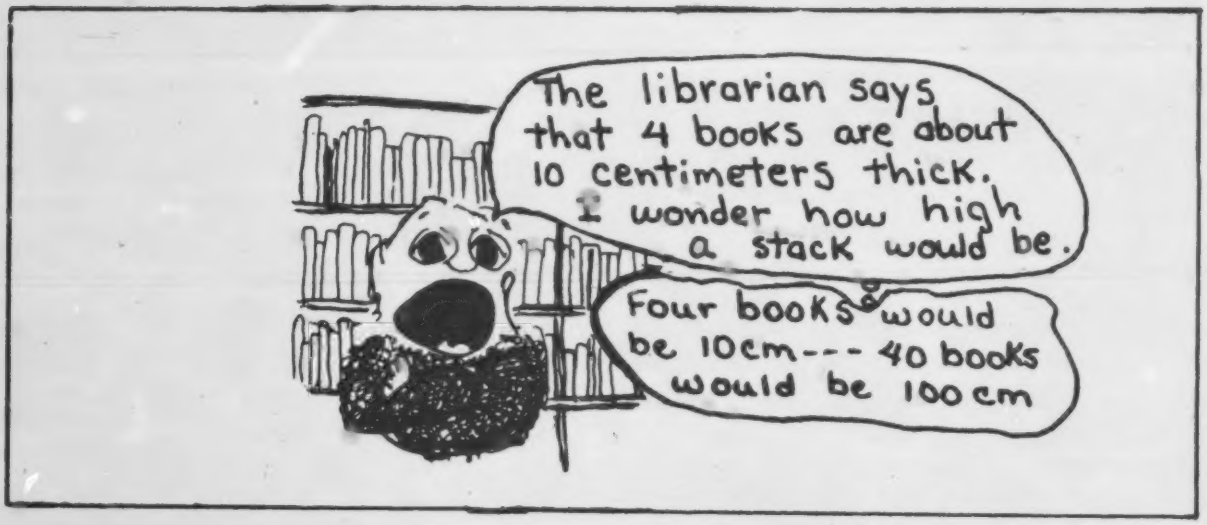
1. How many pages can Rich read in 1 hour? _____

2. The book that Rich is reading is about 200 pages long. About how many hours will Rich spend reading the book? _____

3. Rich is reading on page 65. What page will he be on if he reads for 45 minutes? _____

4. Rich is reading on page 65. He wants to finish the chapter before he stops. The chapter ends on page 95. How long will it take him to finish the chapter? _____

Your comments:


The librarian says that 4 books are about 10 centimeters thick. I wonder how high a stack would be.
Four books would be 10cm--- 40 books would be 100 cm

FILL IN THE TABLE.

Books								
Height								

1. There are 80 science books. How high a stack would they make? _____

2. The librarian says there are about 3200 books in the library. How high a stack would they make if they were all stacked on top of each other? _____

Your comments:

_____

_____

_____

_____

I've listened for 3 minutes and the tape counter has moved from 0 to 36.
I wonder how long the tape plays as the counter moves from 0 to 288.

FILL IN THE TABLE.

Minutes								
Counter Reading								

How long does the tape play as the counter moves

from 0 to 540? _____

The experiences on this page are similar to the activities in this lesson.

Your comments:

_____

_____

_____

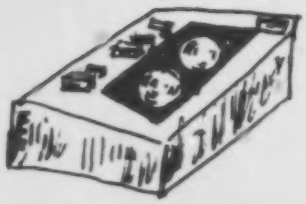
_____

FILL IN SOME ENTRIES IN THE TABLES AND SOLVE THE PROBLEMS.

1. Last night I read 15 pages in 20 minutes. At this rate, how many pages could I read in an hour? _____

2. A stack of 3 paper-back books is 4 centimeters high. My stack of paper-back books is 100 centimeters high. About how many books are in the stack? _____

3. The counter on the tape recorder moves 36 units in playing 3 minutes. How many minutes of tape are played when the counter changes 180 units? _____



Lesson 4 A B

OPTIONAL ACTIVITIES

These optional activities are for early finishing groups.

How much would it cost the school to get the newspaper all school year (36 weeks)?

A.

Weeks of Newspapers	4	
Cost	$2.20	

Lesson 4 A

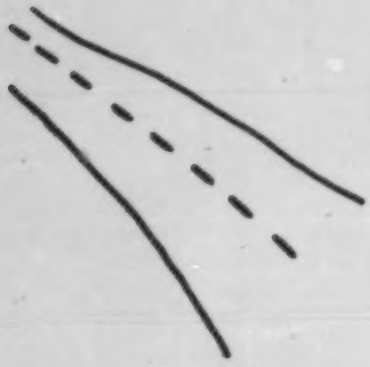
How much does it cost to buy 150 new library books?

B.

Books	1	
Cost	$5	

Lesson 4 A

C.



The engineers who plan interstate highways figure they need 50 acres of land for every mile of highway.

How many acres of land would be used for 200 miles of highway?

Lesson 4 B

D.

Three gum balls for 2 pennies.

How many gum balls for 38 pennies?

Lesson 4 B

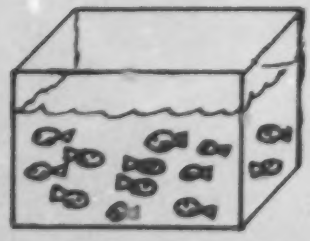
E.

A second-hand store will trade 4 of their comic books for 5 of yours.

How many of their comic books will they trade for 35 of yours?

Lesson 4 B

F.



Three goldfish sell for 50¢.

What is the selling price of 36 goldfish?

Lesson 4 B

Lesson 5 Reading Tables

Purpose: Given completed tables, the students will read them to solve problems.

Rational: Many problems are solved by using a table where the information is provided. Recognizing the relation in a table and identifying the appropriate information is a useful problem solving skill and is often the best way to solve many situations.

Teaching Procedure:

Page 21: Opening scene.

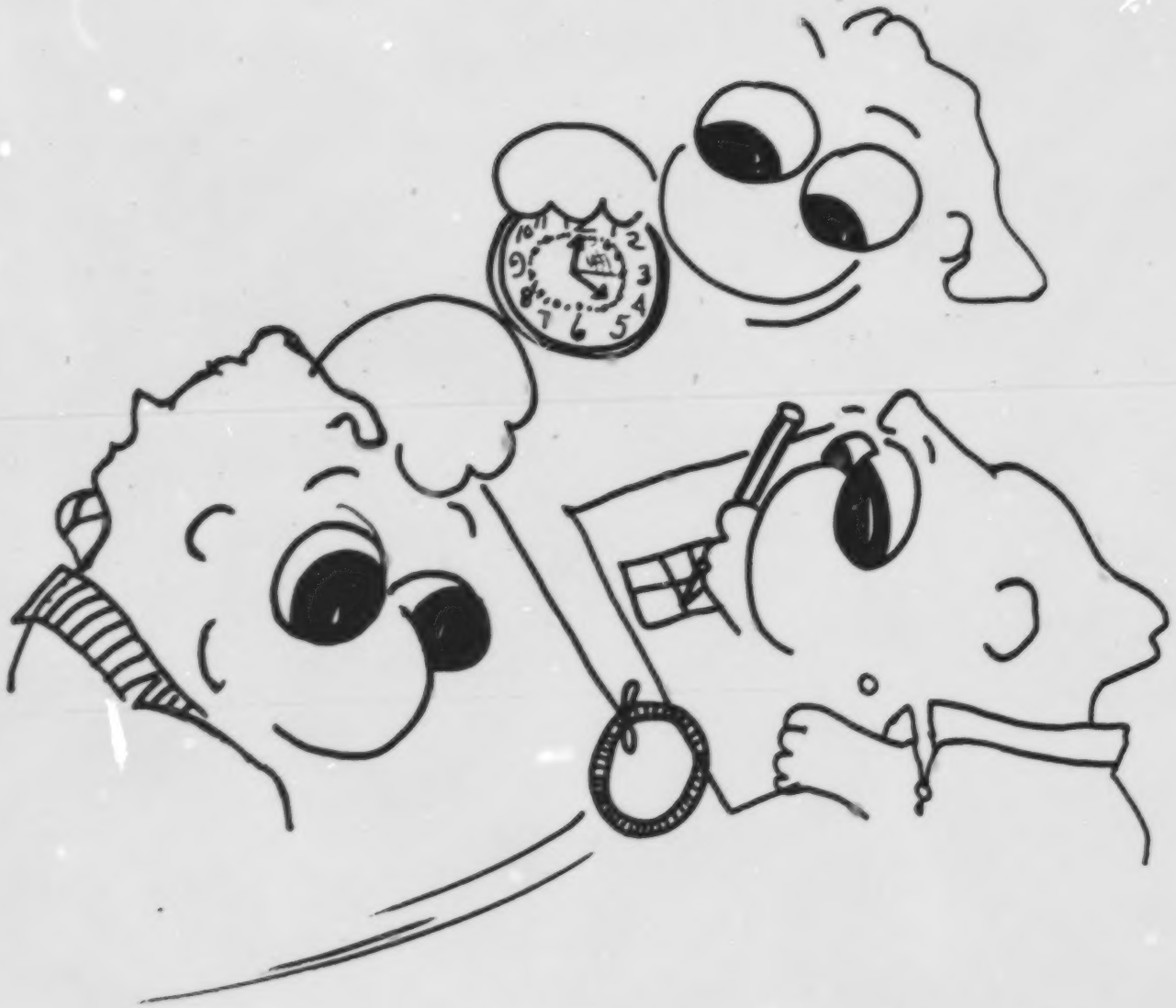
Pages 22 and 23:

1. Get acquainted with the problem setting and read the tables.
2. Have the groups solve the problems at the bottom of the page.
3. Discuss answers.

Pages 24, 25, and 26: Have student groups finish lesson independently.

A and B: Optional sheets for early finishers.

LESSON 5
READING TABLES



The table on this page is a three-dimensional table. It has 3 headings. If students are not acquainted with a pendulum, you might want to make one and conduct an experiment similar to one on this page.

Your comments:

We cut different lengths of string and tied a washer to one end to make a pendulum. We timed and counted the swings for each pendulum.

This is what we found out.

Length of String	25	25	50	50	100	100
Number of Swings	10	20	7	14	5	10
Time in Seconds	10	20	10	20	10	20

USE THE TABLE TO SOLVE THESE PROBLEMS.

1. The length of the string is 50 centimeters. How many swings would the pendulum make in 10 seconds? _____

2. A pendulum made 10 swings in 20 seconds. How many centimeters long was the string? _____

3. How many swings would a 100 centimeter pendulum make in 30 seconds? _____

4. Would a 25 centimeter or a 50 centimeter pendulum swing more times in 10 seconds? _____

Your comments:

_____

_____

_____

_____

This table shows what we found out.

	Mike	Jim	Sara	Jill	Joy
Centimeters	10	5	50	40	20
Inches	4	2	20	16	8

HE TABLE TO SOLVE THESE PROBLEMS.

How many centimeters long is Jim's hair? _____

2. Name the person whose hair is about twice as long as Mike's hair. _____

3. A decimeter is 10 centimeters. Make a list of the people whose hair is longer than a decimeter.

_____ _____ _____

4. One strand of the teacher's hair is 6 inches long. About how many centimeters long is the teacher's hair? _____

This is the first time the students have encountered the need to use data from more than one table. Encourage them to look for the appropriate headings as they solve the problems.

Your comments:

_____

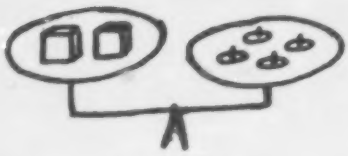
_____

_____

_____

We balanced cubes, tacks, and chips.

This is what we found out.



Cubes	1	2	3	4	5
Tacks	2	4	6	8	10

Tacks	2	4	6	8	10
Chips	3	6	9	12	15

USE THE TABLES TO SOLVE THESE PROBLEMS.

1. Five cubes will balance how many tacks?_____

2. Ten tacks will balance how many chips?_____

3. How many chips will balance 5 cubes?_____

4. Three cubes will balance how many chips?_____

5. Twelve chips will balance how many cubes?_____

6. One cube and 4 tacks will balance how many chips?_____

Your comments:

_____

_____

_____

_____

We use these tables to figure the sales tax on things we buy.

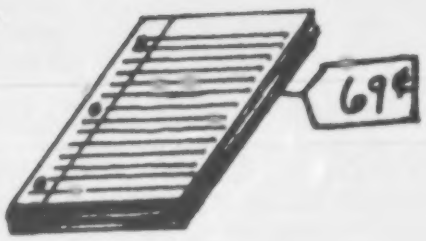
Tax on 1¢ to 99¢

Price	1 to 19¢	20 to 39¢	40 to 59¢	60 to 79¢	80 to 99¢
Tax	0¢	1¢	2¢	3¢	4¢

Tax on $1.00 to $5.00

Price	$1	$2	$3	$4	$5
Tax	5¢	10¢	15¢	20¢	25¢

Use the tables to find the sales tax on these items.

1. 

_____

2.

_____

3.

_____

4.

_____

The experiences on this page are similar to the activities in this lesson.

Your comments:

USE THE TABLES TO SOLVE THESE PROBLEMS.

1.

	Mike	Jim	Sara	Jill	Joy
Centimeters	10	5	50	40	20
Inches	4	2	20	16	8

Bonnie's hair is 45 centimeters long. About how many inches long is her hair? _____

2.

Length of Pendulum	25	25	50	50	100	100
Swings	10	20	7	14	5	10
Time in Seconds	10	20	10	20	10	20

In the table, two pendulums made the same number of swings, but one took twice as long. How many centimeters long were the strings? _____ _____

3.

Cubes	1	2	3	4	5
Tacks	2	4	6	8	10

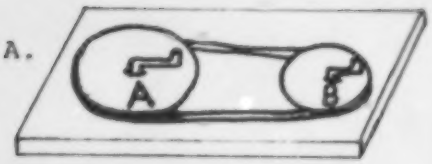
Tacks	2	4	6	8	10
Chips	3	6	9	12	15

Two tacks and 6 chips will balance how many cubes? _____

Lesson 5 A B

OPTIONAL ACTIVITIES

These optional activities are for early finishing groups.

A. 

We turned pulley A and counted the number of turns of pulley B.

Here is what we found out.

Turns of A	2	4	10	20	40
Turns of B	5	10	25	50	100

1. When pulley A turns 20 times, how many times does pulley B turn?
2. When pulley B turns 30 times, how many times does pulley A turn?
3. How many times a minute must you turn pulley A to get pulley B to turn 100 times a minute?

Lesson 5 A

We wound up some toys and timed them as they moved across the floor.

Here is what we found out about their speeds.

B.

	Bus	Car	Truck	Duck
Distance Traveled in Centimeters	150	150	150	150
Time in Seconds	5	3	6	15

1. Which toy had the greatest speed?
2. Which toy had the slowest speed?
3. Which toy was twice as fast as the truck?

USE THIS SALES TAX TABLE TO SOLVE THESE PROBLEMS.

C.

Tax on 1¢ to 99¢

Price	1 to 19¢	20 to 39¢	40 to 59¢	60 to 79¢	80 to 99¢
Tax	0¢	1¢	2¢	3¢	4¢

Tax on $1.00 to $5.00

Price	$1	$2	$3	$4	$5
Tax	5¢	10¢	15¢	20¢	25¢

1. How much tax on 43¢?

2. How much tax on $1.43?

3. How much tax on $4.25?

4. How much tax on $8.87?

Lesson 5 B

USE THIS NEWSPAPER CARRIER'S TABLE TO SOLVE THESE PROBLEMS.

D.

Customers	1	2	4	8	10	20	30
Collection	$4.25	$8.50	$17.00	$34.00	$42.50	$85.00	$127.50
Profit	$.80	$1.60	$3.20	$6.40	$8.00	$16.00	$24.00

1. You have 30 customers. How much money do you collect? What was your profit?

2. Last month you made a profit of $8.00. How many customers did you have then?

3. Pete collected $51.00. How much profit did he make?

4. Would 60 customers give you a monthly profit of $50.00?

Lesson 6 Solving Problems

Purpose: To acquaint students with the problem deck.

Rational: The problem solving deck provides problems at various skill levels and for various topics. Each student should be able to find problems that he can solve and is interested in solving. Both of these ingredients are essential for successful problem solving.

Teaching Procedure:

Page 27: Opening scene.

Page 28:

1. Work in small groups to complete these problems.
2. Check thinking and answers within groups.

Pages 29 and 30, 31 and 32, 33 and 34:

1. Have groups choose blue (easiest), yellow or white (hardest) problems.
2. Work in small groups to complete these problems.
3. Have the groups choose a card from the problem deck.

Problem Deck:

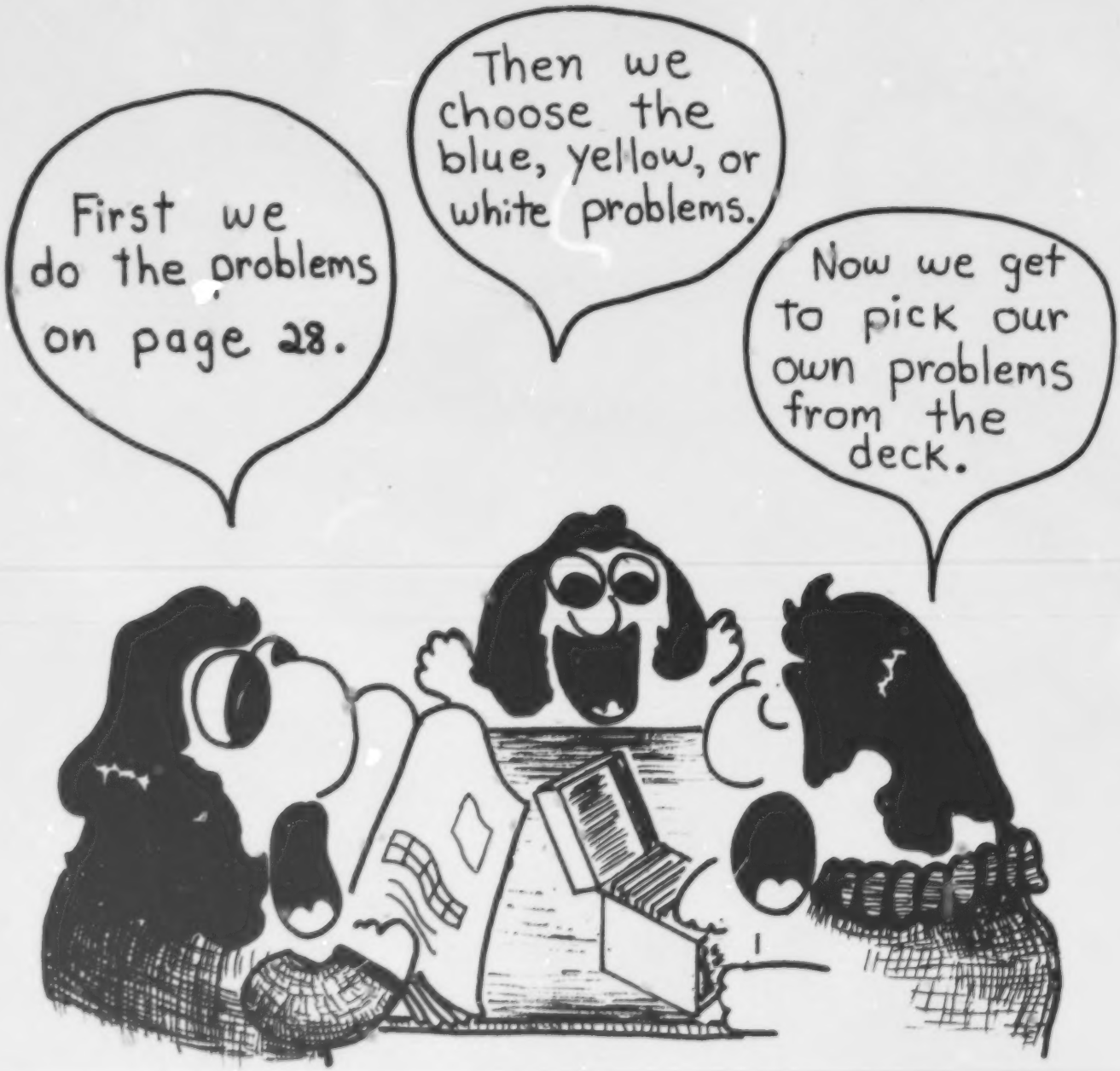
Materials: Calculators
Timer such as a watch with second hand or stop watch
Paper clips
String
Empty thread spools or large beads
Book
Washer or object that can be attached to a string

Teaching Procedure:

1. Have the groups choose a card from the deck.
2. Work in small groups to complete these problems.

TE 40

LESSON 6
SOLVING PROBLEMS


First we do the problems on page 28.
Then we choose the blue, yellow, or white problems.
Now we get to pick our own problems from the deck.

As they near completion of this page, students may need to be reminded to choose the blue, yellow or white problem section of this lesson.

Your comments:

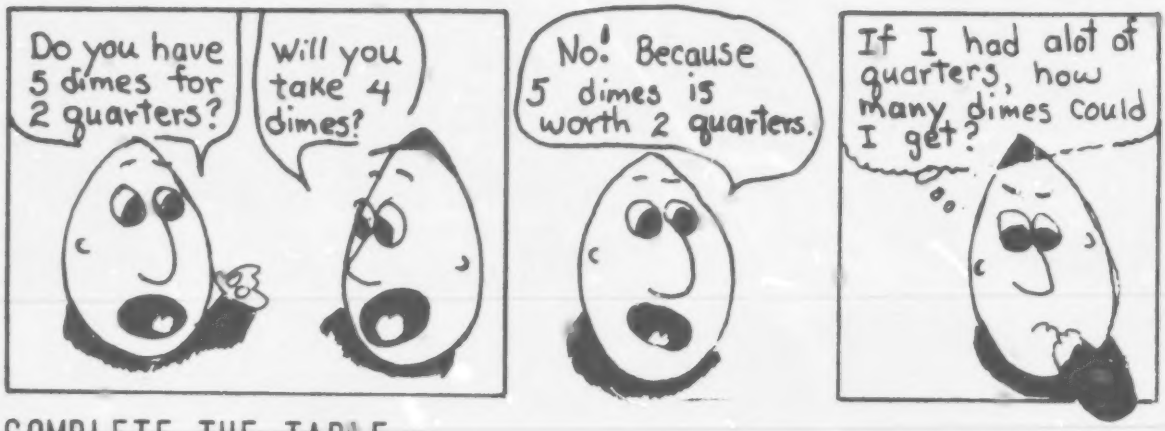
_____

_____

_____

_____

7BM1


Do you have 5 dimes for 2 quarters?
Will you take 4 dimes?
No! Because 5 dimes is worth 2 quarters.
If I had alot of quarters, how many dimes could I get?

COMPLETE THE TABLE.

Dimes	5	10		25		50
Quarters	2		6		16	

10BS1

Do you ever wonder how much blood your heart pumps? Normally, about 60 cubic centimeters of blood are pumped per heart beat.

Cubic Centimeters	60					
Heart Beats	1					

1. How many cubic centimeters of blood are pumped in two beats of a normal heart? _____

2. How many cubic centimeters of blood are pumped in 10 beats? _____

3. How many cubic centimeters of blood are pumped in 50 beats? _____

NOW CHOOSE THE BLUE PROBLEMS, YELLOW PROBLEMS, OR WHITE PROBLEMS.

Your comments:

SOLVE THESE PROBLEMS.

3BC1

COMPLETE THE TABLE.

Meters	5	10		30	35	
Seconds	8		32			80

13BS1

Walt and Jim trade sport cards. Two baseball cards can be traded for 1 football card.

Baseball Cards	2							
Football Cards	1							

1. How many football cards will Walt get for 6 baseball cards?_____
2. How many baseball cards will Jim get for 5 football cards?_____
3. Walt trades 20 baseball cards. How many football cards will he get?_____

As students near completion of this page, they may need to be reminded to go to the problem deck and choose their own problems.

Your comments:

5BS1

Turns of Reel	3						
Feet	5						

1. The fish locator shows fish at 15 feet. How many turns of the handle should I make to lower the bait 15 feet? _____

2. About how deep are you fishing when it takes 12 turns of the handle to raise the bait to the surface? _____

16BR1

We counted tricycle wheels.
Use our table to solve the problems.

Tricycles	1	2	3	4	5	6	7
Small wheels	2	4	6	8	10	12	14
Large wheels	1	2	3	4	5	6	7
Total wheels	3	6	9	12	15	18	21

1. How many small wheels for 5 tricycles? _____

2. How many large wheels for 7 tricycles? _____

3. There are 18 wheels. How many tricycles are there if they have 18 wheels? _____

NOW CHOOSE PROBLEMS FROM THE PROBLEM DECK.

Your comments:

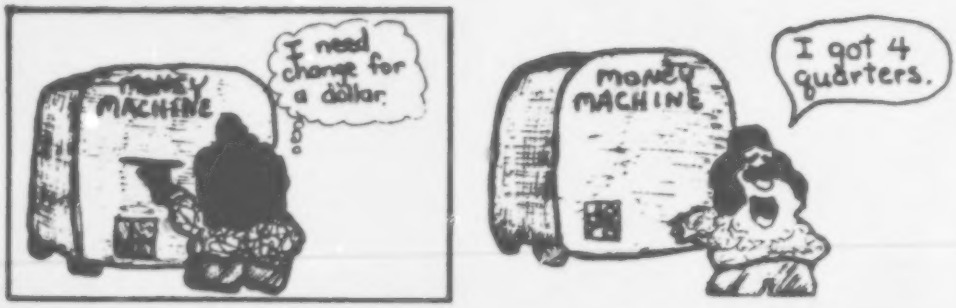
_____

_____

_____

_____

4YS1



Dollars	1									
Quarters	4									

1. How many dollars did you put in if the machine gave you 8 quarters? _____

2. How many quarters do I get for 4 dollars? _____

3. There are 20 quarters in a roll of quarters. How many dollars would I have to put in the machine to get the number of quarters in a roll? _____

8YC1

Five dimes side by side are 9 centimeters long.

COMPLETE THE TABLE.

Dimes	5	10		25	50		150
Centimeters	9		27			180	

As students near completion of this page, they may need to be reminded to go to the problem deck and choose their own problems.

Your comments:

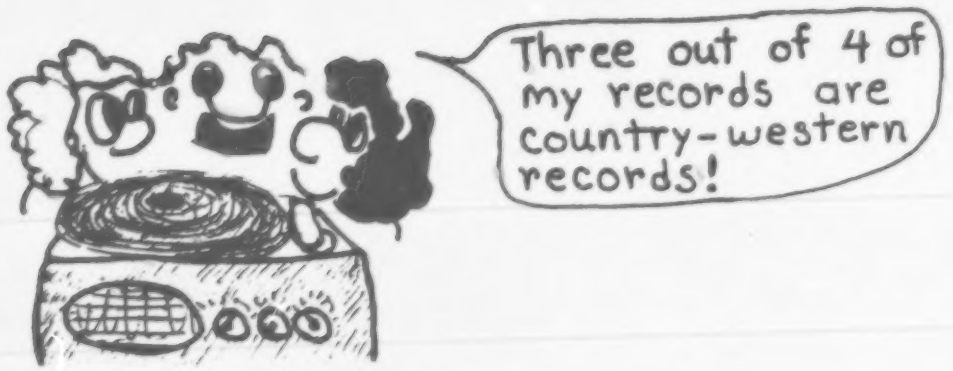
_____

_____

_____

_____

17YB1

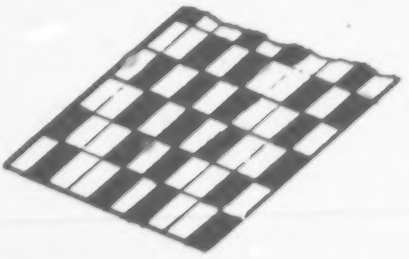


Country-Western	3					
Records	4					

I have 28 records. How many of my records are country-western? _____

12YR1

To make this design, you need 2 dark pieces for every 3 light pieces.



Number of Dark Pieces	2	4	6	8	10	20	40
Number of Light Pieces	3	6	9	12	15	30	60

1. How many light pieces are needed for 8 dark pieces? _____
2. How many dark pieces for 60 light pieces? _____
3. How many dark pieces for 45 light pieces? _____

NOW CHOOSE PROBLEMS FROM THE PROBLEM DECK.

Your comments:

3WS1

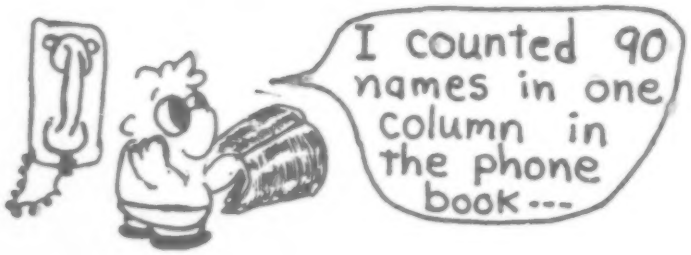
Hey Dad! Look what I found in the paper.
GIVE AWAY. German shepard Call 263-7124
A German shepard is expensive to feed. It takes 4 pounds of food each day.

Pounds										
Days										

1. How many pounds of dog food would you need for 5 days? _____

2. A 100 pound bag of dog food would last how many days? _____

10WC1



COMPLETE THE TABLE.

Columns	1	2		5		15
Names	90		270		900	

1. The name "Smith" fills 6 columns. Estimate how many Smiths are listed. _____

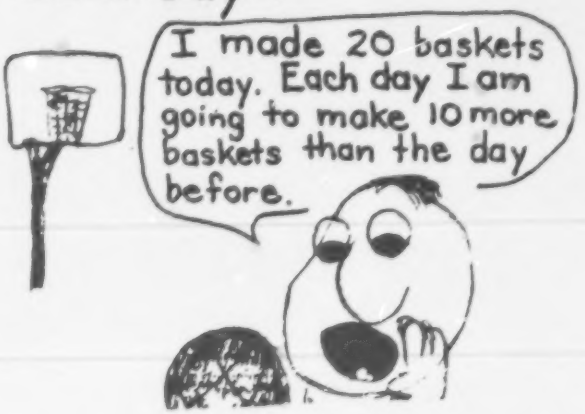
2. Estimate how many names are listed in 25 columns. _____

As students near completion of this page, they may need to be reminded to go to the problem deck and choose their own problems.

Your comments:

2WB1

Saturday...

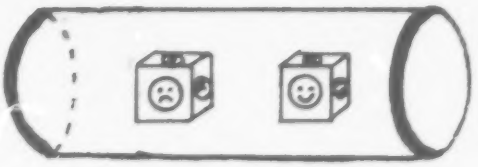


On what day did he make 100 baskets?_____

Days	Sat.	Sun.	Mon.						
Baskets	20								

9WR1

USE THE TABLE TO PLAY THE CUBE-TUBE GAME.



Cubes	1	2	3	4	5	6
Corners	8	16	24	32	40	48
Faces	6	12	18	24	30	36
Edges	12	24	36	48	60	72

FIND HOW MANY CUBES ARE IN THE TUBE FROM THESE CLUES.

Game 1. There are between 40 and 50 edges in the tube._____

Game 2. There are 10 more corners than faces._____

Game 3. There are 4 more edges than corners._____

Game 4. The number of corners plus the number of faces is 42._____

NOW CHOOSE PROBLEMS FROM THE PROBLEM DECK.

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